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THE REMOTE CAUSE

OF

EPIDEMIC DISEASES;

OR,

THE INFLUENCE OF VOLCANIC ACTION IN THE PRODUCTION OF GENERAL PESTILENCES.

BY JOHN PARKIN, M.D.

PART II.

LONDON:
THOMAS HATCHARD, 187, PICCADILLY.
1853.

PRICE ONE SHILLING AND SIXPENCE.

THE REMOTE CAUSE OF EPIDEMIC DISEASES.

SINCE the publication of the first part of this work, it has been evident, either that my arguments have been misunderstood, or, else, that the subject itself was not treated by me, in the first instance, so lucidly and succinctly as to render all my inferences and conclusions apparent to others. In order, therefore, to throw some additional light on a subject confessedly obscure and imperfectly understood, I have been induced to publish this Appendix, and to add the accompanying maps; which, it is probable, will show, more clearly and simply than mere arguments or discussions, certain points connected with the theory I have formed of the cause of epidemic diseases. With this brief explanation, I may now proceed to answer some of the objections that have been made to this theory.

In the Report of the Cholera, drawn up by order of the Registrar-General,—the most valuable that has yet been published on this disease,—Mr. Farr, the writer, thus concludes his notice of my work:—1st, The successive outbreaks of cholera in the districts of England have not, in 1832 or 1849, been preceded, accompanied, or followed, by any earthquake, or visible volcanic phenomena; 2dly, Cholera is, apparently, not more fatal in the immediate neighbourhood of volcanos than it is elsewhere; and, 3dly, The gases, which escape from volcanos, have been analyzed; but the poisonous element has not been identified, or detected, in places suffering from cholera. Nearly the same arguments have been employed, and similar conclusions drawn, by other writers.

As regards the first of these objections, the misunderstanding has probably arisen from these writers confounding the term, volcanic action, with volcanic phenomena—or eruptions and earthquakes. By a reference to my work it will be seen, that I attribute epidemic diseases, not to volcanic eruptions or earthquakes, but, to the cause which produces them. This cause, or, in other words, volcanic action, is, as I infer, a process which commences in some particular part of the globe, and which thence extends over certain well-defined lines of the earth's surface; giving rise to phenomena which vary at different periods—the product being gaseous at first, and solid afterwards. Now, it is more particularly during the former period that, as I have concluded, the great epidemics which have ravaged the earth are observed; being due to the silent and invisible evolution of gaseous matter from volcanic foci, by natural, not artificial, openings. Without waiting now to inquire what these channels are, we may presume it is only when the gaseous matter has accumulated to a certain extent, that it is enabled, by its elasticity, to overcome the forces which oppose its exit. Hence the periodicity of such attacks; and hence, also, the virulence of these diseases; for the poison will thus be extricated in a highly concentrated state. When, however, vents have been formed, by the ejection of incandescent matter from the interior to the surface, and an outlet thus made for the escape of the pent-up gaseous substances, we might *à priori* conclude, that epidemics, if produced by this cause, would either cease altogether, or become less prevalent than before. Such would appear to be the fact. Thus, if we take a well-known volcanic region, the Mediterranean, we shall find that, from the most remote period of which we have any record, this part of the world has been the chosen seat of pestilence and death. Witness the plagues of Egypt, and the pestilences which ravaged ancient Rome, and, the adjoining countries, as France, Germany, Russia, and England. But, since the severe visitation of the fourteenth century, the plague, or, as it was then called, the black death, has been confined to the Mediterranean, or the central portion of this district; instead of extending, as before, to other and distant regions. Various reasons have been given for the non-appearance of plague in the latter countries. In London, it was ascribed to the Great Fire, and the purification and improvement of the city. But this circumstance does not account for the well-known fact, that the epidemic disappeared about the same time, not only in other parts of England, but also in other countries. Some general cause must therefore be sought for, in order to account for its non-appearance. I should myself ascribe it to the increased activity of the volcanos in the Mediterranean; and to the change, which appeared to have taken place about this period, in the action, or the process, going on beneath the surface. This change will be evident by the following detail:—

As is well known, the volcanos in this part of the world are found in three distinct districts, named the Sicilian, the Neapolitan, and the Grecian; but our knowledge is more perfect respecting the two former than the latter. In the first we have Ætna. This volcano appears to have been in a state of activity from the earliest periods of which we have any record; for an eruption caused the

Sicani to desert the country, before the Trojan war. Thucydides also states that, between the colonization of Sicily by the Greeks, and the commencement of the Peloponnesian war, in the year 431 B.C., three eruptions had occurred: while there were nine others before the Christian era.[*] But, in the Neapolitan district, all the volcanos were in a state of *inactivity* from the remotest periods, and until about three centuries before the Christian era. Terrific convulsions then took place in Ischia, and the neighbouring island of Procida, which were followed by eruptions in the former island; for a colony established by Hiero, king of Syracuse, was driven away by the concussions and igneous exhalations. But there was no eruption of Vesuvius until A.D. 79, when Pompeii and Herculaneum were buried under a shower of ashes—*lava not being ejected.* In fact, we have no account of the flowing of a stream of lava from this volcano until the year 1036, being the seventh eruption from the above date. There was an eruption in 1049, and another in 1138, or 9; after which a pause ensued of 164 years, when, in 1302, a lava stream flowed out from a new vent in the island of Ischia. The next eruption occurred in 1306, between which and 1631 there was only one other (in 1500), and that a slight one. But during this period, or interval of repose, Ætna was in a state of unusual activity.[†] "From the commencement of the 13th century," observes Lyell,

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[*] Ætna would appear to have thrown out lava in some of these eruptions, if not in all—for the Carthaginian army was arrested by a stream of melted matter, during its march against Syracuse. It is probable, however, as was the case subsequently with Vesuvius, and as is generally the fact with all *recent* volcanos, that smoke, gaseous matter, and *scoriæ*, were principally given out at that period.

[†] There were only five eruptions of Ætna from the commencement of the Christian era until the year 1329; but from this date, until the end of the 17th century, there were no less than twenty-two.

"to the latter half of the 17th century, the Archipelago, with Southern Italy and Sicily, suffered extraordinary convulsions; while volcanic eruptions in those parts were unusually frequent." In 1693, a violent earthquake shook the whole of Sicily, and killed 60,000 persons.

There had thus been no violent eruption of Vesuvius for 492 years, when, in December 1631, seven streams of lava poured out at once from the crater, and overflowed several villages on the flanks, and at the foot of the mountains. In 1666, there was another eruption, from which time to the present there has been a constant series of eruptions, with rarely an interval of rest exceeding ten years.* It has been precisely during this last period, that the plague has ceased to prevail epidemically in Europe; while its boundaries, or the extent of its range, have become more and more circumscribed—being now confined to a very narrow circle. As to the immediate cause of such a result, this will be readily understood, not only by a reference to the theory under discussion, and to the remarks already made, but, also, from a circumstance that has been observed in the immediate vicinity of Vesuvius. Before this volcano resumed its activity, there was a constant escape of gaseous matter from certain apertures in the Phlegræan Fields, on the other side of the bay; for ancient writers speak of the vapour of Lake Avernus as destructive to animal life. Birds, in fact, could not fly over it, without being stifled. Now, however, they can traverse it with impunity—for noxious exhalations are no longer given out.

The same remarks will apply to earthquakes, for although they appear at periods, and in situations where no volcano is formed; and although the rents and chasms thus generally produced are only temporary—sometimes closing again almost immediately—they occasionally produce the same result. In fact, numerous instances have been recorded of the cessation of plague, immediately after an earthquake.

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* During this increased activity of Vesuvius, Ætna has been more tranquil; seventeen eruptions only having been recorded from the end of the 17th century until the year 1819, while there were thirty-three of Vesuvius.

It would thus appear, that volcanic eruptions and earthquakes are not necessary, in order to establish the truth of my theory—for epidemic diseases ought to be expected prior to their appearance, rather than afterwards. Still, the occurrence of either the one or the other is, nevertheless, an important fact, as affording conclusive evidence of subterranean action in that particular spot. It may therefore be as well to remark, that, although eruptions have not occurred, earthquakes have been experienced over a considerable portion of the route pursued by the epidemic cholera; and this, too, in situations where such phenomena had not been observed for centuries—as in the upper provinces of India. Their occurrence, violence, and extension, previously to the subsidence of the "black death" in Europe, was very remarkable, as has been more particularly dwelt upon in the first part of my work.

We will now consider the second objection, viz., that cholera is not more fatal in the immediate neighbourhood of volcanos than it is elsewhere. The reason of this will be readily understood, if, as I infer, each volcanic district is independent of the other—at the same time that the result of the process varies in each, according to the date, or its duration. Thus, in the oldest districts—where extinct volcanos exist—the only phenomena witnessed are the escape of caloric, with gaseous and saline matter, from the mouths of springs—producing hot or cold mineral waters. In such situations, epidemic, and the majority of endemic, diseases are unknown, as I have more particularly pointed out in another place.*

In the districts nearest to these, in point of age, we find active volcanos, the intervals between the eruptions being longer or shorter, according to circumstances, or the date of their formation. These eruptions are sometimes accompanied, preceded, or followed, by earthquakes, which also vary in frequency and intensity; being more violent and more extensive in the neighbourhood of those volcanos that are the most recent.

Thus, if we look to the most ancient of the existing volcanic districts, we shall find that epidemics are unknown, and the class of endemics comparatively rare. This is the case in the countries adjoining that remarkable chain of volcanos, which occupies the range of the Andes, in South America.† According to Baron Humboldt, these volcanos—the principal of which are situated in the colossal summits of the Andes, as Cotopaxi and Tungurchua—scarcely have an eruption once in a century. The period, therefore, when they will become extinct is not probably far distant, geologically speaking.

In other situations, however, where the volcanos are of a more recent date, epidemics are experienced, while the endemics are of a more severe form; their severity and frequency being in exact ratio with the date of the volcanos, and the duration of the process, or action, that produces them. Thus, the most severe epidemics and endemics of which we have any record occurred in Egypt, in former ages, and in Italy, in more recent ones; while they have gradually decreased in intensity, up to the present time.

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* "Statistical Report of the Epidemic Cholera in Jamaica." Chapter, "Prevention of the Disease."

† Dr. Bryson remarks that, with some few exceptions in which fevers and ague exist, both sides of the Andes are eminently salubrious. ("Statistical Reports of the Health of the Navy, from 1837 to 1843.")

In those districts, on the other hand, where neither active nor extinct volcanos are found, the earthquake is the only phenomenon, which denotes the existence of volcanic action beneath the surface. When this occurs in districts, where such phenomena were previously unknown, and where no signs exist of the previous operation of this cause beneath the surface, we have reason to infer that a new volcanic line is being formed. Now it is precisely in such situations that, as I have concluded, epidemic diseases of a distinct, and, perhaps, previously unknown, character are experienced. As, also, each volcanic district is distinct, the one from the other, while the process itself varies in each, at the same epoch; we should naturally expect to find, that the diseases which prevail there would also vary, either in character or intensity. This is actually the case; for while plague is confined to the Mediterranean, yellow fever is the epidemic of the West Indies, and dysentery—in its severest form—that of the East; while it is impossible to account for this difference by any cause existing above the surface—the temperature, soil, and all external circumstances being, apparently, the same. Such being the case, it will not be surprising to find, that the epidemic cholera has prevailed least of all in the neighbourhood of volcanos; while its non-appearance in such situations, so far from being contrary to my theory, is rather in favour of it.

But, although these different districts are quite distinct, it should be remembered, that ancient and modern systems, as Lyell has justly remarked, may cross and interfere with each other. Thus, five active volcanos traverse Mexico from east to west, intersecting the range of the Andes at an angle of 70°; while the line is continued beneath the waters of the ocean, connecting them in a westerly direction with the volcanic group of islands, called the Isles of Revillagigedo, and, in an easterly one, with the West Indian Islands.* In other instances, the new volcanic line would appear to be lost in the old one, and not to have proceeded any further in that direction. This geological fact is interesting and important on the present occasion; as it may throw some light on a very singular circumstance connected with the progress of the epidemic cholera, and which has hitherto remained unexplained. It will be remembered, that the principal route which the disease took, after leaving India, was up the Persian Gulf, and along the course of the Tigris and Euphrates; whence it proceeded, in almost a direct line, to Antioch, which experienced a severe visitation in 1823. It was naturally expected, that the countries to the north of the Mediterranean would then have been invaded, and that Europe was destined to be attacked from this point. Instead of this, the disease extended no further in that direction—Europe being invaded by another route, after an interval of *seven* years.

It now only remains to notice the third and last objection, which is, that, although we are acquainted with a great many gases, which are given out from the ducts of volcanos, the same substances have not been detected in the air of those places where cholera has prevailed. To this I would observe, that cholera and other diseases cannot be produced by any of those gases, which are generally, and almost uniformly, given out from the ducts of volcanos; not only because these gases, when inspired artificially, produce different results, but, also, from the fact, that, although the evolution of gaseous matter is pretty uniform, and sometimes very abundant, persons who reside in the immediate neighbourhood of volcanos are seldom attacked with disease—at least as the consequence of eruptions.

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* Lyell, *op. cit.*, page 317.

As, therefore, the poison of cholera, if generated in subterranean reservoirs, must be different to the gases usually given out from the ducts of volcanos, the whole of which, at least those that have been detected, correspond with well known chemical compounds; it cannot be more surprising, that this unknown and invisible substance should have escaped detection, than that malaria, the existence of which we are certain of, should have remained so long undetected and unknown. Not only are we certain, that the latter poison exists in the air of particular places, and over extended surfaces of the globe; but, we also know the laws which regulate its extrication from the surface, and its diffusion in the surrounding air. Notwithstanding this, and the fact that it must be, at particular times and in particular localities, in a highly concentrated state; chemists have altogether failed in their attempts to detect this poisonous substance, or, to ascertain its nature or composition. And thus it will continue, until the science of chemistry is more advanced, or, until accident demonstrates the existence and nature of these invisible agents.

We have, however, ample proof that poisonous elements, destructive of animal life, are generated in subterranean reservoirs; for, occasionally, the surrounding inhabitants are attacked with disease, immediately after a particular eruption. But, it is more particularly after the occurrence of earthquakes, when chasms are produced, that men and cattle have been swept off by pestilence—several examples of which have been recorded in the first part of this work.

Having thus answered, what I consider to be, the principal objections that have been advanced against the theory under consideration, I shall content myself now with referring those interested in the subject, and anxious for further information, to the work itself—in which will be found all the facts and arguments upon which my conclusions rest. I would wish, however, before closing these remarks, to call the attention of my readers to the history, as therein detailed, of "the black death" of the fourteenth century; by which it will be seen, that pestilence, concussions of the earth, and atmospherical vicissitudes, with floods, inundations, and failure of the crops, prevailed at the same time, and to an extent that has never been witnessed since. The occurrence of the latter phenomena, at epidemic periods, is well worthy of consideration at the present moment; for, if it be true, that they are due to the same cause as the former, and that the whole are common effects of a common cause, we shall have additional evidence afforded us of the operation of volcanic action, along the whole line of route pursued by the epidemic cholera. Although, at the time of the publication of my work, such phenomena could not have prevailed to any extent in Europe, I nevertheless dwelt upon the remarkable fact, that great and unusual atmospherical vicissitudes had occurred in India, subsequently to the appearance of the epidemic cholera; being more remarkable in that climate, on account of the regularity of the seasons at all other periods.

It was, also, my object to show, that the blights and pestilences in the vegetable creation were due to the same cause; while, also, an inference was naturally drawn that the same visitations might be expected now, as at former epidemic periods. This was in 1841, before the appearance of the potato disease, or the other maladies which, of late years, have affected the vegetable kingdom. As, however, this subject has been more fully discussed in the first part of this work, and in another expressly devoted to its consideration, it must be unnecessary to do more than allude to the circumstance on this occasion.

It is right to remark, also, in the last place, that the truth or fallacy of this theory is not only interesting in a scientific, but also in a practical point of view ; for, unless we have clear and distinct notions as to the cause, it is impossible that we can adopt effective and certain measures for the prevention of the disease.

EXPLANATION OF THE MAPS.

In the first map have been delineated the three principal volcanic regions of the world, in order to show, that the phenomena connected with volcanic action are confined to particular lines of the earth's surface—the geographical boundaries of which have been well ascertained, and accurately defined, by geologists. On the same map has been traced the principal route of the epidemic cholera, or, the *presumed* and newly-formed volcanic line.

In the next map, we have a very remarkable example of the curvilinear direction which volcanic lines sometimes pursue.* In this instance, as well as in that of the

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* This map has been copied from one in " Lyell's Geology," but this fact, through an inadvertence, has not been inserted in the engraving. Having left a rough sketch with the lithographer, just previous to my departure from England, I found the whole, contrary to my intention or wish, finished on my

Andes, in the first map, the volcanic line is distinctly marked, and easily traced, by the range of volcanos, or vents, which extend along the whole line at comparatively short distances. But, in other instances, as in the Mediterranean, the volcanos, instead of extending along the whole of the line, or the principal part of it, are grouped together in the centre of the district. In these cases, the extent of the subterranean region has been well ascertained by observing the direction of the concussions, and the limitation of their effects—a result easily obtained, for it is a well-known fact, that earthquakes return again and again to the same spot, and along the same line; being experienced, at the same moment, at very distant points—hundreds of miles apart.

It is also to be remarked, that, as volcanic *foci,* or reservoirs, invariably extend beyond the range of volcanos, the actual lines reach much farther than the limits assigned to them on the maps. Although, therefore, the cholera track would appear to be greater than either of the volcanic lines, it is, probably, not so in reality. In fact, as the volcanos of the Andes extend a distance as great as from the pole to the equator; if we conclude, that the same line is continued beneath the surface, for a third more of that distance, the range of the subterranean action would be fully equal to that of the epidemic cholera, on the surface of the earth.

It may not be superfluous to add, also, that the boundaries of the different volcanic regions, as designated in the maps, are, to a great extent, imaginary; for the minor effects of volcanic action are felt to considerable distances,

return. It was, consequently, too late then to make any alteration. This must also be my excuse for one or two other omissions and inaccuracies in the first map.

on either side of the great central line—as defined by the formation of vents, or the severity of the shocks, when earthquakes are experienced. Thus, in the earthquake at Oporto, in 1755, although the severity of the shock was confined to one particular line, running east and west, minor effects of the same shock—such as agitation in the air and in *the waters of lakes and springs*—were remarked on the same day, and in different spots, in France, England, Germany, Sweden, Norway, &c.

The third map has been added, in order to show, that those atmospherical phenomena, termed hurricanes, and which have been referred by me to the same common cause, are also confined to particular lines of the earth's surface; at the same time that they are only witnessed in the neighbourhood of volcanic regions—as those of the West Indies, the Mauritius, and the China sea.

While, however, all the severe hurricanes of which we have any record occur in recent volcanic districts, it is a remarkable circumstance, and confirmative of the conclusions which I have drawn on the subject, as to the connexion which exists between these various phenomena, that, in the regions where epidemic diseases are unknown, there also the hurricane is not experienced. This is the case along the line of the Andes, for the writer before quoted (Dr. Bryson) informs us, that the regions immediately contiguous to this great chain are not swept by the typhoon, or the tornado; and, except the pampero of the Plate, there are few violent commotions of the earth.

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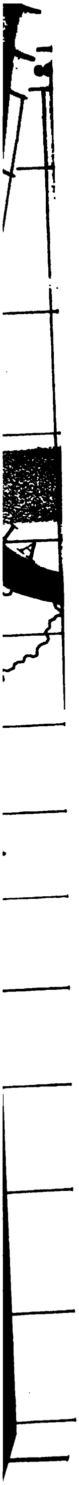

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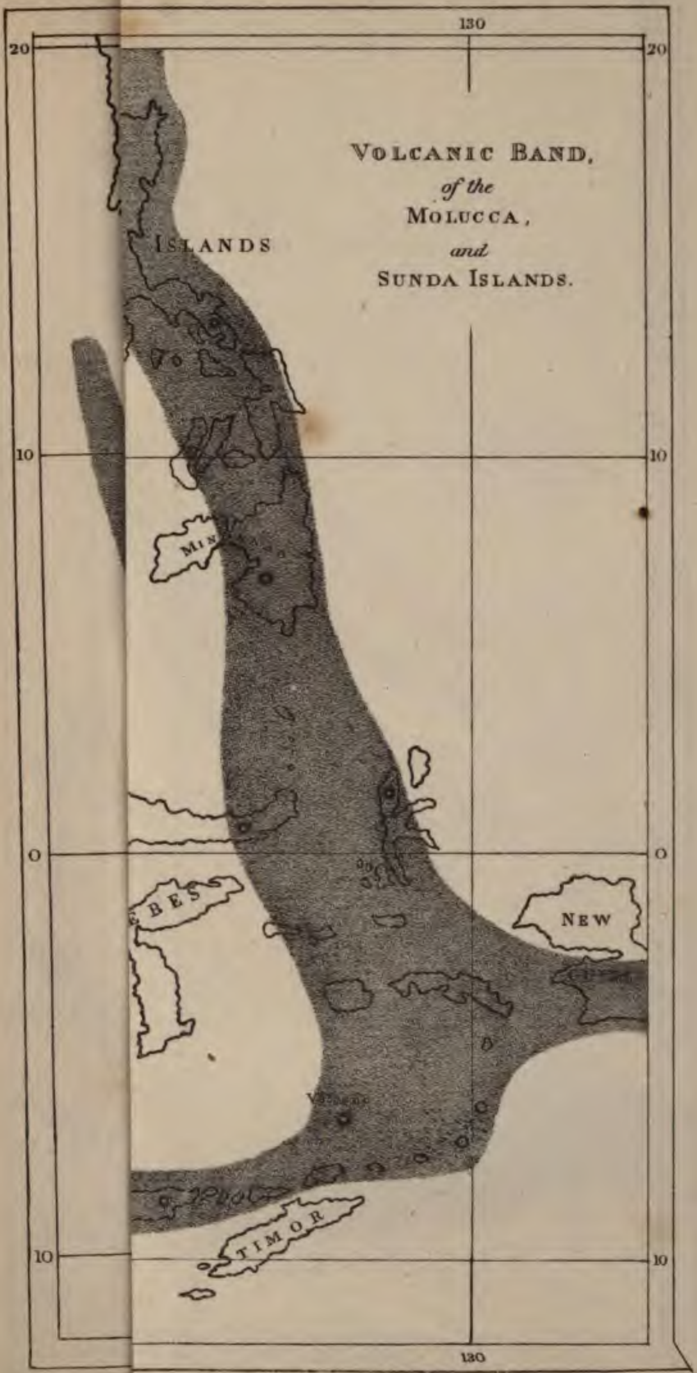

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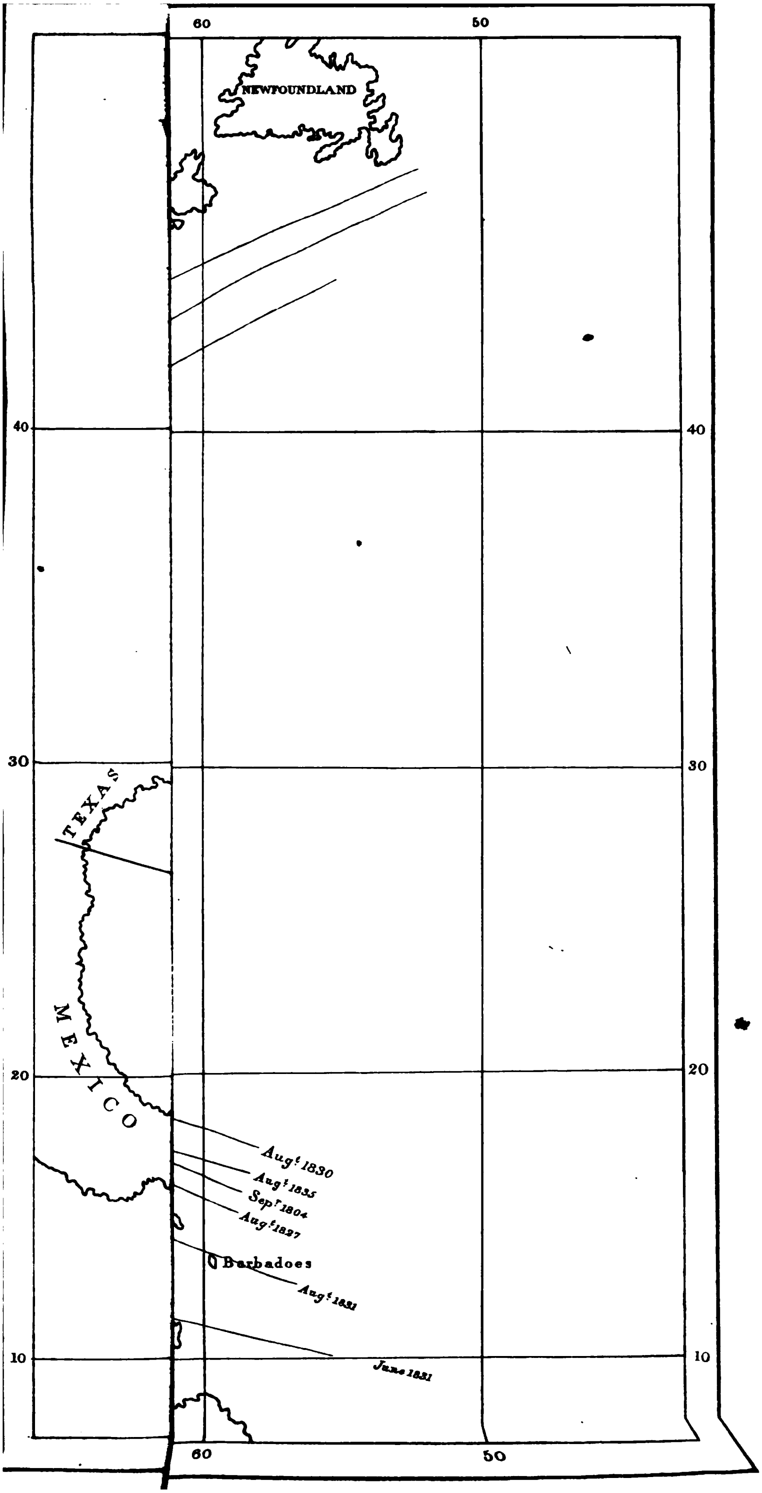
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